CHAPTER-VII

CONCLUSION, FINDINGS AND SUGGESTIONS

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7.1 CONCLUSION

The road network in India, present a vast spectrum ranging from rural roads to four/six/eight lane highway system. Transports are known as the life line of economy. An efficient and cheap system of transport is considered as a very important aspect in the economic development of a large country, like India. A good network of roads, railway lines, waterways and airways benefits to agricultural and industrial progress, development of internal and external trade, promotes tourism and encourage of highway related tertiary functions.

For the purpose of administration, maintenance and functions, Indian roads can be broadly classified into 4 categories. They are National Highways, state highways, major district roads and village or rural roads. Among these National Highways play a very important role in the mobility and connectivity. India have a good number of National Highways with 79116 km (2014) length.

At present there are 224 National Highways in India, some of the National highways which connects four major metropolitan cities constitute of India. They are NH-2 from Delhi to Kolkata, Calcutta-Chennai East west coastal highway; NH-4 Chennai to Mumbai and Mumbai-Delhi are part of the Golden Quadrilateral apart from this there are two more vital highway project in India, East-West, North-West corridor.

The Golden Quadrilateral Highway connects four important metropolitan cities like Delhi, Kolkata, Chennai and Mumbai via., Bangalore with a total length of 5846 km. And it also connects important agricultural hinterlands. Industrial areas, other important National Highways, major ports and important trading centres of India. The Golden Quadrilateral project establishes better and faster transport
networks between many major cities and ports. It provides an impetus to smoother movement of products and people within India. Urbanization along the Golden Quadrilateral Stretch has seen expansion of transport services along with increase number of transport vehicles and movement of men and materials.

The Golden Quadrilateral Highway is also influenced on land use /land cover changes along the Highway. Urban oriented functions were developed and increasing the standard of living of who were settled along the Golden Quadrilateral.

The first chapter of the research thesis consist of introduction of the topic, followed by statement of the problem. The present research consist seven important clearly set objectives and also consist of methodology, hypotheses, organization of thesis and limitation of the study.

Golden Quadrilateral Highway facilitates their increased cultivation and also helps their fast transportation. It is promoting the land uses and development activities related economic liberalization and globalization in Karnataka, India and in the study area.

More number of highway related urban functions are located from Bangalore to Tumkur and Mulbagal to Tumkur Stretch. Some special economic zones have been developed along the Golden Quadrilateral Highway.

The author has discussed about the objectives of the present study, methodology and hypothesis.

In the second chapter consists of a detailed note on the review of literature, a reviewing rationale for engaging in primary research. The author has discussed the review of literature under the global scenario and national scenario, various research topics were discussed in review of literature.

The third chapter mainly consists of a detailed study of Study Area Golden Quadrilateral Highway stretch as present study area is nothing but a part of former National Highway No.4. Our study is from Mulbagal in the east to Tumkur City in
the North west. It lies around 13° N latitude and between 76°- 78° East longitude. The total length of the GQL in the study area is about 170 kms. The study area can be divided into two sections they are Mulbagal to Bangalore stretch and Bangalore to Tumkur stretch.

Golden Quadrilateral Highway Stretch in India, in Karnataka and in the study area. Section-I is Delhi-Kolkata Stretch of Golden Quadrilateral. It runs through Uttarpradesh, Bihar, Jharkhanad and West Bengal. It is basically rich Indo Gangetic Plain. This stretch of Golden Quadrilateral passes through rich agricultural and rich mineral belts of India. Second section of the Golden Quadrilateral is Kolkata, Chennai Stretch. It passes through the states of West Bengal, Orissa, Andhra Pradesh and Tamilnadam. This stretch of Golden Quadrilateral connects eastern fringe of Chotanagpur Plateau and major iron and steel industries in Orissa, West Bengal and Andhra Pradesh. Section-III, Chennai to Mumbai. It comprises two major segments like Chennai to Bangalore and Bangalore to Mumbai, Chennai to Bangalore connects important industrial towns like Ranipet, Vellore and Chitter. Bangalore to Mumbai Stretch of Golden Quadrilateral touches some of the industrial and district headquarters like Tumkur, Chitradurga, Harishara, Davangre, Hubli, Dharwad and Belgaum. It has a important Agricultural and Industrial hub of South India. Variety of engineering and metallurgical industrial, transportation hubs agro-based industries centres located along this stretch.

The last and fourth section is Mumbai-Delhi Stretch of Golden Quadrilateral. It connects famous industrial cities of Western major industrial zone of India. They are Vapi, Surat, Vadodara and Ahmedabad. Golden Quadrilateral touches arid Rajasthan but it passes through major cement, textiles, marbel producing regions of India.

Under Golden Quadrilateral Highway in Karnataka, researcher has given certain details of important national highways in Karnataka and their importance. The total length of Golden Quadrilateral in Karnataka is about 737 km. It passes through Mulbagal, Kolar, Bangalore, Tumkur, Chitradurga, Haveri, Hubli, Dharwad and
Belgaum. They are class-I and class-II towns and also leading commercial, educational and industrial centres.

For the purpose of convenience of study area and also there are some physiographic aspects the entire stretch of Golden Quadrilateral Highway in Karnataka has been broadly divided into three sections, they are Eastern Stretch of Golden Quadrilateral from Mulbagal to Bangalore. This is 100kms Stretch. This stretch passes through red soils and a rainshadow region of peninsular India. Agriculturally dry land crops are predominant in almost its 20kms stretch around the Bangalore city this Golden Quadrilateral passes through densely urbanized and industrial zone of Bangalore.

Middle Stretch of Golden Quadrilateral Stretch from Bangalore to Davangere. It passes through the districts of Tumkur, Sira, Hiriyur, Chitradurga, Davangere and Haveri. Dry lands crops like Jowar, chilies, soya, maize and ragi are predominant. Some of the agro based industries like coconut coir processing, oil extraction, and cotton textile industries are located along the Golden Quadrilateral.

North Western Stretch of Golden Quadrilateral Highway in Karnataka passes through Haveri, Hubli, Dharwad and Belgaum. Hubli-Dharwad is the second largest conurbation in Karnataka, after Bangalore this is one of the beautiful stretch of Golden Quadrilateral Highway in Karnataka. It passes through panoramic semi-western ghats. Beetle leaves cultivation can be seen beyond Haveri Dharwad has one of the largest automotive assembly factory developed by Tata motors. Golden Quadrilateral Highway Stretch between Mulbagal and Tumkur has mentioned many times. The stretch between Mulbagal and K.R.Puram are not leading industrial centres but yet near Kolar, near Mulbagal around quadrilateral Stretch of Bangalore city there is growth of secondary functions. Bangalore-Tumkur stretch of Golden Quadrilateral from Bangalore city to Tumkur city. The development of Golden Quadrilateral Stretch in the study area has highly affected the settlements and occupation of in terms of primary secondary and tertiary functions. Recently SEZ’s were setup between Hoskote and Kolar and Bangalore to Tumkur.
Chapter-IV deals with the dimension of urbanization along the Golden Quadrilateral Stretch between Mulbagal and Tumkur urbanization that is the concentration of non-agricultural population in towns and cities is happening at various levels right from historical days. Urbanization is one of the most important geographic phenomena in today’s world. The urbanization of rural areas are now irreversible due to the global shift of technological industrial and service based economies.

Urban is any place that is non-rural, while urbanisation is the process that transforms a population from rural to urban expansion of government services, growth of employment opportunities and infrastructure facilities are the important causes of urbanisation in India. In India general urbanization as per 2011 is around 31.15%, over the years there was been continuous concentration of population in class-I and II cities, because of good basic amenities.

Karnataka ranks fourth in the degree of urbanization. Along the major states in India, as per the 2011 census, 23.62 (%) million persons reside in urban areas. The important features of Karnataka’s urbanization is the distribution of urban population along the major highways and other important state highways.

However in ensuring years owing to the overall economic development further industrialization in newly established SEZ’s. Urbanization is going to be in wider regional scale.

In the study area, there were 7 towns and cities total urban population was 3.6 million in 1991. The total urban population has increased to 4.7 million by 2001 from 3.6 million there was a average growth of 24.47% during this period. By 2011, the total urban population of the study area was over 9 million. Under the weight of Bangalore metropolis other urban settlements though these have seen continuous growth of population.

Finally researcher has discussed the emerging towns along the Golden Quadrilateral in Karnataka and study area. Some of the big rural settlements which
have very close to class-V and VI both in population are lessening rural characteristics are considered as emerging towns. In the study area between Mulbagal to Tumkur. There are three settlements namely, Narasapura Avalahalli on Kolar-Bangalore Stretch and Madavara on Bangalore Tumkur stretch have more than 5000 population and also with reducing primary workers and substantial increase of secondary and tertiary workers have the potention of future growth into towns.

In this chapter researcher has studied about aspects of transport along the Golden Quadrilateral Highway. The important advantages of well developed and maintained National highway networks are faster, comfortable journeys, reduced fuel consumption, safer travel benefits to trade especially in movement of light and perishable goods etc. Mulbagal is a town and taluk head quarter of Mulbagal taluk in the Kolar district. It lies just off the National Highway. Many transport and travel business set up their base here. Golden Quadrilateral, a newly, four lane road from Bangalore to Mulbagal. Connecting Bangalore with Chennai via Chittor. The Kolar has its own transport named Antharagange Nagara Sarige. Kolar has transportation amenities such as buses, taxies and autoriskhas.

Hoskote is a taluk head quarters of the Hoskote town. It lies at the intersection of Golden Quadrilateral and NH-7. Hoskote is well connected with Bangalore buses (BMTC as well as KSRTC).

Krishnarajpuram is a suburb of Bangalore Krishnarajpuram located at the junction of old Madras road and outer-ring road of Bangalore city. Many industries, software industries are located along the Golden Quadrilateral and old Madras road.

In order to understand the composition and frequency flow of motor vehicles, present study considered traffic count points. These two prints are nothing but the two toll collection plaza. Toward Bangalore Chennai Golden Quadrilateral is three times growth of total number of vehicles viz., in all there were 10.3 million vehicles in 2010 and the number increased to 18.3 million by 2014 in all categories of vehicles between Mulbagal to Bangalore Stretch.
Researcher has discussed the road connectivity along Golden Quadrilateral between Mulbagal and Tumkur. Golden Quadrilateral provides nation wide accessibility, connecting with Bangalore city. Golden Quadrilateral also provides good connectivity with state highways, MDR and important connectivity with rural settlements. In this last section of this chapter-IV an attempt has been made to study the distribution of various transport related activities like petrol bunks, vulcanizing centres, hotels/motels and Dhabas.

In the **fifth** chapter, which is the core chapter, the scholar has discussed the land use /land cover changes along the Golden Quadrilateral Highway between Mulbagal to Tumkur for the purpose of detailed analysis researcher has made systematic effort has been made by using remotely sensed data for 2000 and 2012 to different years IRS imageries have been carried out. The study region shows seven broad categories of prevailing land uses. The details of both left and right side land use /land cover scenario along Golden Quadrilateral in 2000. In 2000, on an average 71.62% of area under agricultural land, there were about 0.72% of land under agricultural fallow land. The average built up land was about 12.48%, forest area accounts for about 3.99%, average waste land was about 5.06%, water bodies occupies about 6.12% and the average wet lands from Mulbagal to Tumkur was about 0.01 on either side of Golden Quadrilateral Highway.

The detail study again it provides total of both left and right sides of the Golden Quadrilateral land use and land cover by 2012-13. In 2012-13, there were 65.49% of areas under agricultural land use, about 2% of area under agricultural fallow land. The average built up area in the study area was about over 18%, over 5% of area under forest. The average wasteland from Mulbagal to Tumkur was 3.51%, water bodies accounts for about 5.91% and wet land covers about only 0.14%.

A special effort has been made to special study of land acquisition and structures acquired for construction of Golden Quadrilateral. The field study revealed that there are 125 villages which have been awarded compensation for the land acquired and structure demolished. As per the data, the total land acquired was 2.6
million square meters. Where Mulbagal to Bangalore Stretch accounted for 70.15% land acquired and Bangalore to Tumkur accounted for 29.85% of land acquired.

Mulbagal to Bangalore Stretch had account for 58.36% of dry lands 6.2% of wet lands and another 6.3% was garden land acquired for Golden Quadrilateral construction. Since all these categories of lands are agricultural suitable land which might have attracted more compensation.

Bangalore to Tumkur Stretch, the total land acquired was about 7 lakh 90 thousand sq. mts. This stretch accounted for about nearly 30% of land acquired for the conversion dry land were 70% wet lands were 9% and garden lands were about 2%. All these together accounts for about 81%, where these are agricultural suitable land must have attracted more compensation remaining land accounted for only 19% must demanded have less compensation. Over 80% of settlements were demolished in Mulbagal to Bangalore stretch and there were 20% of settlements demolished in Bangalore to Tumkur Stretch.

In the fifth chapter an effort has been done to through light on the analyzing agricultural scenario along the Golden Quadrilateral.

Agricultural scenario is based on sample study of 277 households in 45 villages along Golden Quadrilateral in 3 bands of upto 5km, 5-10km and 10-15 km.

As the highway herald the wider connectivity and accessibility even the agricultural land uses too have undergone observable changes urban oriented agriculture and horticulture. National highways particularly Golden Quadrilateral is more beneficial for speedy movement of perishable agricultural products like vegetables, flowers and fruits. Stretch-1 i.e., Mulbagal, Kolar, K.R.Puram over 30% of land use is under urban oriented agriculture under the influence of highway horticultural crops (mango, chikko, grapes) are cultivated and remaining 70% of land under dry lands crops like ragi, jowar, maize etc.

The second stretch is Nelamangala-Tumkur-Sira Stretch. It is mostly rainfed, where in general usual agricultural land use accounts for about 73% where in dry
lands ragi, soya, jowar, cotton, tur crops are cultivated, but with tanks and tubewells irrigation which are support to coconut, arecanut and even small stretches of paddy. Stretch-3 is Chitradurga and Davangere Highway runs into middle section of Karnataka, general cropping scenario also slightly changes this is on one hand due to canal irrigation which rich black soils around Davangere. Between Sira and Hiriyur one can see highway passing through dense grooves of coconut arecanut. Due to irrigation sugarcane and sunflower crops also cultivated.

Stretch-4 is Haveri Hubli in this section Golden Quadrilateral Highway runs in the heart of middle section of Karnataka. It is a black cotton soil region. Under the influence of highway in this stretch mango, chikko, guava, vegetables, flowers cultivation is rise in this section. Beetle leaves cultivation can be seen beyond Haveri. The last stretch is Dharwad, Belgaum and Nippani. Golden Quadrilateral passes through semi Western Ghats in this section. General agricultural land use consists of dominating sugarcane and to some extent crops like cotton, maize, sunflower, jowar and paddy. It is a beautiful experience to see mango and guava grooves near Dharwad particularly towards Kittur.

In the sub section, aspects like details of agricultural crops cultivated in either side of Golden Quadrilateral Highway between Mulbagal to Tumkur have agricultural scenario is based on sample study of 277 households in 45 villages along Golden Quadrilateral. Sample villages accounted for 728 acres of total agricultural land in which 66% of the land is a dry land and 34% is wet land over 70% of agricultural land comes under to ragi cultivation, 3% of area under groundnut cultivation, 17% of area under coconut cultivation and remaining area under cultivation of minor millets, fruits, and flowers.

In the fag end, aspects of conservation of the environment along the Golden Quadrilateral emphasis is given on greenery. Where researcher has investigated existing tree cover along the Golden Quadrilateral particularly in the study area between Mulbagal and Tumkur. The tree cover not only provides green cover along the highway but it works as great carbon sink, consequences of this widening of NH-4
like highway lost valuable trees which where hundred years of old planted on either side of former two lane highways. There is a need to plant conventional /traditional avenue trees along the Golden Quadrilateral. Researcher finally suggest to the systematic tree planting at the rate of 45+45 =90 trees per km in the study area.

In the Sixth, an attempt has been done to understand the population characteristics, size of settlements and occupational structure of the population. For the purpose analysis settlements on either side of Golden Quadrilateral Highway have been taken here first 0-5km, 5-10km and 10-15 km on either side of highway. The details of 82 villages, which lie on Golden Quadrilateral Highway with population and the impact of Golden Quadrilateral, these 82 villages are distributed in about eight taluks of former Kolar, Bangalore rural, and Tumkur District.

The detail study of further provides, villages which lie exactly on the highway by taluk wise distribution and also brings very interesting population characteristics of the study region. As a whole as sum 33% growth rate between 2001-2011. Bangalore North has seen highest population growth rate (52%). However the least population growth rate can be seen in Tumkur Stretch. Coming to settlements in the 5 km stretch on either side of Golden Quadrilateral there are 257 (47.24%) of villages of various size to the left side of the Golden Quadrilateral. Towards left while coming from Mulbagal to Tumkur there are 287 (52.76) of villages to the right side of the Golden Quadrilateral Highway totally 544 villages on either side of Golden Quadrilateral (5km buffer). Further coming to the population characteristics of these 544 villages, they had a total population of 3.65 lakhs in 1991, which has increased to 4.7 lakhs by 2011. And these villages had a total population almost 6 lakhs by 2011.

The author has attempted to find out the occupational structure of the sample households, the villages on the highway, highway to 5km, 5km to 10km and 10km, 15km. The general observation regarding to occupation, more number of population were engaged (on an average 80% to 86% in all the bands) in primary occupation. Around 8 to 9% of people were engaged in secondary and between 71% to 11% of people were engaged in tertiary functions.
7.2 FINDINGS

1. Golden Quadrilateral Highway stretch in Karnataka forms an artery running almost in the middle of Karnataka in a rich and evolving horticultural floriculture and vegetable growing areas. Hoskote is famous for button rose cultivation.

2. A careful observation of land use and land cover change in the study area shows the built up land has been increased from 12.48% in 2000 to 17.68% in 2012 due to impact of Golden Quadrilateral Stretch (GQL).

3. To some extent some of the formal rural settlements under the influence of the Golden Quadrilateral Stretch (GQL) have emerged as tertiary service providing centres like hotels, motels, vulcanizing centres etc.

4. In the east direction of Golden Quadrilateral K.R. Puram is one of the important suburban industrial town of Bangalore City. Many industries like electronics, SKF, Volvo (bus and truck manufacturer) prestige home appliances have been developed along the eastern stretch of Golden Quadrilateral Highway.

5. The development of Golden Quadrilateral Stretch in study area has highly affected the settlements and occupation of people in terms of primary secondary and tertiary functions.

6. Highway development has brought changes in occupational, structure, particularly taking out people from primary occupation to tertiary functions.

7. The widening, upgrading/good maintenance and converting of road lane from two lane to four six lanes of NH-4 in the study are is more beneficial for smoother movement of passengers, agricultural products, from agricultural hinterlands.

8. Special Economic zones (SEZ’s) have been developed in the vicinity of Golden Quadrilateral Stretch (GQL) highway in study area (Nandagudi-Hoskote Taluk).
9. There are a quite a good number of emerging towns which are getting urban status after the completion of four/six lane national highway. For example Dabaspet Hirihalli and Avalahalli etc.

10. Between Nelamangala and Tumkur we see rapid growth of non-agricultural land uses particularly industrial and transport infrastructure related land uses like Godown, Petrol bunks, Garages etc.

11. Agricultural lands has been decreased from 71.62% in 2000 to 65.49 in 2012 between Mulbagal to Tumkur due to impact of GQL.

12. At several locations, has the highway has been upgraded into international standards to Multilane, there is rapid increase of movement of cars, buses, multi axel vehicles. For example between Kolar and Mulbagal.

13. There are three emerging towns namely, Narasapura, Avala Halli and Madavara along the GQL stretch between Mulbagal to Tumkur. They have more than 5000 population and also with reducing primary workers and substantial increase of secondary and tertiary workers.

14. Golden Quadrilateral Highway connectivity with state highways and major district roads between Mulbagal and Tumkur. Example Malur, Srinivasapura in the Eastern Stretch of GQL and Madhugiri and Koratagere in the northwestern stretch of GQL.

15. Kolar district is a leads district in Karnataka in Eucalyptus plantation. In fact GQL provides direct lorry transportation the stacks to Harihar Poly Fiber factory near Chitradurga.

16. Beetle leaves cultivation can be seen beyond Haveri.

17. Tumkur District as a special name in cultivation of coconut. Large coconut growing areas are located near Tumkur and its surrounding areas. For example Tiptur.
7.3 SUGGESTIONS

1. India is a land of villages including the study area. For the smooth management of traffic on the Golden Quadrilateral Highway (GQL), there is need to consider a number of under passes, over passes. Though present study reveals such aspects have come up but they are not sufficient aspects only at big villages such aspects of come up there is a need to look into such highway related aspects.

2. Highway related services; generally way side eateries (Dhabhas) Motels have come up randomly. Often without proper lay bares only a few motels have limited lay bares, often lorries, often trucks with multiaxel block the view and leading to accident. This needs construction and has marking extra space for lay bare with transport related infrastructure.

3. Though the NHAI of India’s, private developers have acquired huge quality of land it has not been put to right amount of green cover. Study has revealed it is possible have a avenue trees for end and edge of highway stretch this ensures carbon sink at the same time development with environmental concern. In many places highway projects bare linear ribbon like development without any greenery. Conventional tree planting as says in the thesis ensure greenery carbon sink and environmental protection to a great extent which need to be considered.